

“Ben Hill Griffin & O’Connell Center Reservoirs”

To gain an appreciation of the water consumption needs for a modest city such as Gainesville, we will consider converting UF’s football stadium or the O’Connell Center into a water reservoir. Each group should divide into two teams (sub-group A and B), with each sub-group answering the following questions in a short report to be posted on Canvas by one of the Co-Captains before 5:00pm on the due date. Formatting guidelines are attached.

1. Calculate how many days of water can be stored in the Ben Hill Griffin Reservoir (Group A) or the O’Connell Center Reservoir (Group B). Assume that the exits can be perfectly sealed, that the open sections can be readily filled in and that the structure will support the stadium/arena being filled to the top with water. Use average daily water consumption rates for Gainesville per Gainesville Regional Utilities (GRU) published values. Report your calculated total reservoir capacity (**gallons**), and then your days of water supply to two significant figures.
2. As many regions of the world run out of sources of fresh water, desalination becomes a leading technology to produce fresh water from sea water or brackish water. A very common technology is multi-stage flash distillation (https://en.wikipedia.org/wiki/Multi-stage_flash_distillation). Assume your reservoir was filled with sea water; calculate how much energy would be required to distill the entire reservoir using multi-stage flash distillation. If all this energy was supplied by burning gasoline, how many gallons of gasoline would be required? You may assume 100% of the gasoline’s available energy content would be used for the distillation process. Assuming you can purchase gasoline for \$2.5/gallon, calculate the cost to distill your reservoir, reporting your final cost as **dollars per KGA** of water (KGA = 1000 gallons). Only consider the cost of your gasoline (i.e. ignore all other capital and operating costs). Compare this energy cost to the current GRU residential cost of water of about \$2.35 per KGA and discuss briefly. Include comments on how changes in our assumptions would impact this analysis.
3. Find some average US values for daily water consumption per person. Using these values and Gainesville’s metropolitan area population (assume GRU serves the entire metro area), calculate Gainesville’s expected daily water consumption and compare to the published GRU daily rates. Discuss your findings, and comment on whether the estimates you identified are appropriate for Gainesville. What factors may affect average water consumption? Select one of Gainesville’s sister cities: https://en.wikipedia.org/wiki/List_of_sister_cities_in_Florida, and compare Gainesville’s per person daily water consumption with one of our sister cities. If you can’t find good data for an exact sister city, select a reasonable city near the sister city. How does this city compare to Gainesville? Why might your estimate be similar or different?
4. Include a group photo of at least 4 of your sub-group members taken in Ben Hill Griffin stadium (Group A) or near the O-Connell Center (Group B). NOTE: Photos are optional during the COVID-19 pandemic.

Report Template for Ben Hill Griffin / O-Connell Center Reservoir Project

Title

Prepared by:

Co-Captain Group A

Co-Captain Group B

Other Team Member 1

Other Team Member 2

...

Date

[Include picture of each subgroup at the stadium/O'Dome here and start remainder of report on next page. Note picture is optional during COVID-19 restrictions]

Introduction. *Introductory paragraph (3-5 sentences) to set the stage for the reader and motivate the report. Why do we care about water usage? What will you be discussing?*

1. Days of water in “Ben Hill Griffin/O’Connell Reservoir”. *Writing with proper grammar and syntax, answer Part 1 in this section. Clearly state all assumptions used to do the calculations (a bulleted list is fine) and be sure to define, describe, and/or reference any estimates used. Include an Appendix I at the end of the document showing how you did the calculations (a scan of handwritten notes, an Excel spreadsheet, MATLAB m-file, etc.).*

2. Energy for desalination. *After describing multi-state flash distillation in 1-2 sentences, report your findings from Part 2. Be sure to use proper written English and document your assumptions. Include an Appendix II at the end of the document showing how you did the calculations (a scan of handwritten notes, an Excel spreadsheet, MATLAB m-file, etc.).*

3. Variations in water consumption. *State your findings, estimates, and assumptions and discuss as outlined in Part 3. Include an Appendix III at the end of the document showing how you did the calculations (a scan of handwritten notes, an Excel spreadsheet, MATLAB m-file, etc.).*

Conclusion. *Summarize your findings in a few sentences and suggest additional analyses that you would like to do if you had more time. (Don’t worry we won’t make you do them!)*